

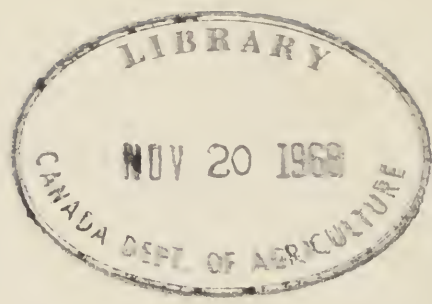
Corn

FOR LIVESTOCK AND POULTRY

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INTRODUCTION

Corn has been called the "King of Feeds," and rightly so, as it surpasses all other grain and forage crops in available net energy per acre of feed. Corn is ideal for feeding to livestock and poultry and is a valuable ingredient in modern rations.

Large quantities of corn grain are imported into Canada each year. The demand for corn is steadily increasing, due to the steady rise in livestock population, and this trend is expected to continue. A good part of the demand could be met by expanding corn acreages in southern parts of Ontario, Manitoba, Quebec and, to a lesser extent, Alberta, Saskatchewan, British Columbia and the Maritimes.

The background of the page features several stylized, hand-drawn yellow corn cobs. The cobs are oriented vertically and are composed of a series of small, interconnected loops that form the kernels and the central stalk. The drawing style is simple and illustrative, with a consistent yellow color for all elements.

Corn

FOR LIVESTOCK AND POULTRY

CORN YIELD

When cultivated in a good environment, corn will yield about 100 bushels per acre. A good stand of corn will also yield 18 tons of silage per acre. This amount of feed provides about 7,000 pounds of Total Digestible Nutrients (T.D.N.), which is sufficient for 2.5 cattle.

Climate limits corn production and yield in many parts of Canada. The fastest-growing corn hybrid of today still requires more than 100 frost-free days to reach maturity. It is quite possible that new, hardier and earlier-maturing hybrids will be developed in the near future, and these will extend the present corn-growing boundaries (see map). In the meantime, a corn producer located in a favorable area can obtain satisfactory yields by seeding as early as possible and to the best hybrid available for his locality. To promote rapid growth, the producer should use fertilizers at the recommended rates and irrigate when necessary. Greater returns can also be expected by controlling weeds, insects, and diseases.

For further information on corn production and harvesting methods, consult Publication 1025, GROWING CORN, obtainable from the Information Division, Canada Department of Agriculture, Ottawa.

NUTRITIVE VALUE OF CORN

Much of the quality or nutritive value of corn depends on the variety, the fertility of the soil, the amount of fertilizer used, and the climate. Some corn varieties or hybrids produce highly nutritious animal feed, whereas others because of their high oil or sugar content are useful for other purposes. The content of protein and phosphorus, both important ingredients in feed corn, can be increased slightly by proper fertilizer applications, whereas sugar and oil content can only be increased by breeding and selection. Presently, plant breeders are developing a new hybrid having high lysine content, which will increase the protein value of corn.

Corn, because of its high T.D.N. value, represents the energy portion of a livestock ration. But, it must be balanced with other feed ingredients to make a complete ration because it is low in protein and other nutrients. The nutritive values, of corn and some of the other common feeds are compared in Table 1.

TYPES OF CORN FEED

Few plants are as adaptable to a livestock feeding program as corn. It can be used as green chop, as silage, or as shelled corn. About half the corn produced in Canada is utilized as silage and the remainder as grain feed.

GREEN CHOP: In late summer, corn may be fed to livestock as green chop to supplement pasture or as a substitute for other feeds in short supply. However, the full value of a corn field as a source of energy food, is not realized until the ears are fully matured. Green chop is easily harvested by a field chopper and blown into a feeder wagon that empties directly into feed bunks.

CORN SILAGE: Where corn can be grown successfully, it makes by far the best forage. To provide feed during the winter months, much of the corn produced in this country is preserved as silage. The main features of corn silage are that it is high in palatability, gives high yield per acre of feed, is easy to produce and handle, and keeps well for an indefinite period. In general, corn plants should be harvested when fully matured, that is, when the kernels are dented. However, immature corn or frosted corn is often ensiled.

TABLE 1. PERCENTAGE OF MAIN NUTRIENTS FOUND IN CORN AND OTHER FEEDS, BASED ON DRY MATTER ANALYSIS

Nutrients	Alfalfa Hay	Ground Barley	Ground Corn	Corn and Cobs	Whole Plant Corn Silage	Ground Oats	Ground Wheat
Proteins	16.0	12.0	10.6	9.2	8.3	12.8	14.0
Fats	2.0	2.0	4.4	3.7	3.0	5.0	2.0
Fiber	32.0	5.8	3.2	9.2	25.0	12.0	3.0
Carbo- hydrates	33.8	68.0	69.0	65.0	—	58.0	68.0
Ash	8.9	2.8	1.4	1.8	6.0	3.5	1.8
Calcium	1.50	0.08	0.03	0.05	0.30	0.10	0.06
Phos- phorus	0.24	0.45	0.28	0.30	0.24	0.35	0.04
T.D.N. (energy)	54.0	80.0	90.0	84.0	64.0	69.0	86.0

Source: Feed Composition Tables, National Academy of Science, N.R.C., Washington, D.C., 1964.

When corn is chopped for the silo, it should have a moisture content of 65 to 70 percent. The right moisture content is very important as it ensures proper fermentation. Too little moisture results in mouldy silage. This also occurs when the corn silage has not been sufficiently well packed or sealed in the silo. Too high a moisture content causes an unpalatable product, which may be slimy or have a strong, objectionable butyric or ammonia odor. To prevent wastage, it is necessary to chop the corn to half-inch size, pack it tightly into clean silos, and most important, harvest the corn at the correct stage of maturity. During the first ten days in the silo, bacteria will break down plant sugars to form lactic acid that will act as a preservative for the ensiled

corn. It is during this period that toxic gases are produced; therefore, the silo must be well aerated before being entered.

There are a number of different kinds of corn silage: The most common is whole-plant corn silage made from the entire plant. Harvesting is a once-over field operation which makes maximum use of plant material produced. This type of silage packs well in the silo, is a homogeneous mixture, and is high in palatability. Because of its fibrous content, beef cattle on a maintenance ration require no other roughage.

Center-cut corn silage is produced in some areas because of its higher nutritive value. As the name implies, only the central portion of the corn plant, that containing the ears, is harvested, chopped, and ensiled. It is popular for feeding to feeders and stockers.

For corn silage with still greater grain content, the ears only can be harvested, chopped, and ensiled. This is usually referred to as high-moisture corn ear silage, to differentiate it from dry corn-ear meal.

Finally, shelled corn can be ensiled as high-moisture corn grain. This is an excellent energy feed, especially when low-quality hay is readily available at low cost.

Further information on corn silages and their use is given in Publication CORN SILAGES IN ONTARIO, available from the Ontario Department of Agriculture and Food, Toronto, Ontario.

CORN GRAIN: Where corn can be grown to maturity, corn ears are harvested by mechanical pickers and stored in a corn crib until required. These corn ears, which retain little if any of their husks, are ground up and mixed with other ingredients to provide livestock and poultry rations.

A more modern approach is to harvest corn with a picker-sheller or self-propelled combine with a corn header. To be harvested by this method, corn grain should contain 30 percent moisture or less. When the corn is picked and shelled in one operation, it must be artificially dried until it retains only 14 or 15 percent moisture before being stored in bins.

COST OF 1 POUND OF PROTEIN IN COMMON FEEDS

Feed	Per cent protein	Pounds of protein per ton	Cost per pound of protein in cents when cost per ton is:			
			\$25.00	\$50.00	\$75.00	\$100.00
Barley	12.0	240	10.4	20.8	31.2	41.6
Corn	10.6	212	11.8	23.6	35.4	47.2
Oats	12.8	256	9.8	19.6	29.3	39.2
Wheat	14.0	280	8.9	17.9	26.8	35.7
Linseed meal	33.9	678	3.7	7.4	11.1	14.8
Soybean meal	44.0	880	2.9	5.7	8.5	11.4
24% Dairy concentrate	24.0	480	5.2	10.4	15.6	20.8



FEEDING CORN TO LIVESTOCK

Many Canadian farmers and ranchers are unable to produce their own corn, and therefore purchase it from nearby feed dealers or growers. Corn grain must be ground or rolled before being fed to livestock, to obtain maximum feed value. Since corn represents the energy or T.D.N. portion of a ration, a protein concentrate — usually rapeseed, linseed, or soybean meal — and necessary minerals and vitamins are added while mixing.

Mature cattle can receive up to 6 to 10 pounds of corn grain per day in addition to their regular roughage. For fattening cattle, corn is worth up to 12 percent more than barley, and it has almost the same value as wheat. For growing, lactating, or reproducing livestock, rations having higher protein content than that provided by corn is required. Proteins are the costliest item in animal rations, and the farmer would do well to seek out cheaper protein substitutes. On the other hand, feeding livestock more protein than is required is uneconomical.

UREA: Cattle, like other ruminants, can utilize cheaper proteins quite effectively. One of these is urea, a chemical compound high in nitrogen. It can be substituted for higher-priced proteins to supplement corn silage. It has been said that “successful management of ruminant animals depends, first of all, upon proper nutrition of the rumen bacteria.” Apparently, micro-organisms present in the digestive system can convert urea into usable protein for the host. By substituting urea for some of the protein in a supplement, the cattle feeder using corn silage can save about \$1.00 per hundredweight of gain in feed costs. However, urea can be toxic to cattle when used in excess of 3 percent or when improperly mixed. Urea by itself is unpalatable to livestock and should therefore be well mixed in a highly palatable and succulent feed such as corn silage or green chop.

FEEDING CORN TO BEEF CATTLE

Feed-lot cattle fed exclusively on whole-plant corn silage will consume 5 to 6 pounds per 100 pounds live weight. To finish steers for the market, whole-plant corn silage should be supplemented with additional grain at the rate of 2 pounds daily per head.



Areas of Canada suitable for corn production (based on heat unit ratings)

CANADA



SUITABLE FOR GRAIN CORN



SUITABLE FOR SILAGE CORN



Another popular feed for beef cattle is corn-ear silage. It is more flexible than whole-plant corn silage in the preparation or mixing of various kinds of rations. Also, because it is chopped more finely, less whole grain passes through the animal undigested. Corn-ear silage provides some but not all the roughage needed in beef cattle rations. To provide the roughage required, it is best to feed 3 to 4 pounds of good-quality hay per day.

Sample rations for feed-lot steers weighing 400 to 700 pounds, and finishing steers, weighing 700 to 1,000 pounds, are shown below:

	<u>Corn Silage</u> %	<u>Barley</u> %	<u>Oats</u> %	<u>Supplement*</u> %
Feed-lot steers	40	55	—	5
Finishing steers	40	25	30	5

***Contains high-protein meal, trace minerals, dicalcium phosphate and vitamin A (10,000 to 20,000 I.U.)**

Where good hay is plentiful and corn grain is available at reasonable prices, beef cattle can be fed a ration containing 80 percent corn grain, 12 percent brome-alfalfa hay and 8 percent protein supplement.

An increase in growth of about 18 percent and a feed efficiency of about 10 percent can be obtained by using the hormone stilbestrol. This hormone is normally implanted in an animal's ear but it can also be injected or added to feed.

For further information on feeding corn to beef cattle see Publication BEEF HUSBANDRY IN ONTARIO, available from the Ontario Department of Agriculture and Food, Toronto, Ontario.

FEEDING CORN TO DAIRY CATTLE

Profitable dairy farming depends on a well-balanced diet which is both economical and highly nutritious. Scientific advances in animal nutrition during the past 20 years have increased milk production per cow by about 60 percent.

The amount of feed required by dairy cattle depends upon age, size of animal, and milk yield. Lactating cows or cows-in-calf require feed having a proportionately higher protein content than dry cows or beef cattle.

Dairy cattle find corn silage very acceptable because of its high palatability and succulence, and they never seem to tire of it like other foods. Because of this, corn silage promotes feed consumption, which results in high milk output. A cow producing 10,000 pounds of milk per year yields about 400 pounds of fat, 330 pounds of protein, 500 pounds of sugars (mostly lactose), and 20 pounds of calcium and phosphorus together. Therefore,



Feed bunks along a fenceline are convenient for distributing corn rations to a large herd of beef cattle.

dairy cattle rations must contain these nutrients in proper proportions. In addition, dairy cows must be supplied with sufficient feed to meet body growth, and reproduction requirements.

Dairy cattle also require a high level of vitamins A and D. If yellow corn is the basic ingredient in a dairy cattle ration, then most of the vitamin A will be supplied. Vitamin D should be supplemented, particularly for growing or milking cows.

A basic standard ration for milking cows should contain 14 to 18 percent crude protein, 72 to 77 percent T.D.N., 10 to 12 percent fiber, and about 3 to 4 percent fat. It is also recommended that milking cattle be given, in addition to her regular rations, 1 pound of corn grain for every 3 to 5 pounds of milk produced daily. To each 100 pounds of grain, add 2 to 3 pounds of a suitable salt-mineral concentrate or commercial supplement.

Further information on feeding corn to dairy cattle is given in Publication 519, DAIRY HUSBANDRY IN ONTARIO, available from the Ontario Department of Agriculture and Food, Toronto, Ontario.

FEEDING CORN TO PIGS

Corn is used extensively for feeding pigs, because of its high T.D.N. value. However, hogs fed an unbalanced corn ration tend to become too fat and will not meet with ready acceptance by the consumer. Modern pig production depends on well-balanced diets which will result in quality lean carcasses. Since modern pig feeding can include up to 50 different nutrients, it is difficult for the farmer to produce and mix his own feed rations.

A pig enterprise should be located where feed is plentiful and cheap. Feed costs account for as much as three quarters of the total cost of raising pigs; profitable hog production depends, therefore, on an efficient, low-cost, well-balanced feeding program. Pigs fed a balanced ration require 600 to 750 pounds of feed from weaning to market, whereas a full-grown sow requires

These young pigs obtain their corn rations from self feeders



as much as 2,500 pounds of feed per year. The cost of a sow's feed should be charged against her litters. To make a profit, the hog producer must have his sows bred twice a year, and he must market a minimum of 15 pigs annually for each sow on his farm.

Protein is the most important and expensive nutrient in pig rations. Unlike cattle and other ruminants, pigs cannot use cheap proteins. They must have easily digestible, high-quality animal proteins such as fishmeal, tankage, milk by-products or, as second choice, enriched plant proteins such as soybean or rapeseed meal.

Pig rations vary according to age, size and reproductive stage. A sample sow ration during gestation can include 500 pounds of corn or wheat, 700 pounds of oats, 500 pounds of alfalfa meal and 300 pounds of sow supplement (35 to 40 percent protein concentrate).

Commercial feed supplements are available for pre-starter, starter, grower and finisher pigs and for reproducing sows.

Sample pig rations are given in Publication 1126, PIG FEEDING, which is available from the Information Division, Canada Department of Agriculture, Ottawa.

COST OF GRAIN PER TON AT GIVEN PRICE PER BUSHEL

Price	Barley	Corn	Ear Corn	Oats	Wheat
\$0.75	\$31.25	\$26.79	\$21.43	\$44.12	\$25.00
0.85	35.42	30.36	24.28	49.99	28.33
0.95	39.58	33.93	27.14	55.88	31.67
1.05	43.75	37.50	30.00	66.76	35.00
1.15	47.92	41.07	32.86	67.64	38.33
1.25	52.08	44.64	35.71	73.52	41.67
1.35	56.25	48.21	38.57	79.41	45.00
1.45	60.42	51.79	41.33	85.29	48.33
1.55	64.58	55.36	44.28	91.17	51.67
1.65	68.75	58.93	47.14	97.05	55.00
1.75	72.92	62.50	50.00	102.93	58.33
1.85	77.08	66.07	52.86	108.82	61.67
1.95	81.25	69.64	55.71	114.70	65.00
2.05	85.42	73.21	58.57	120.58	68.33
2.15	89.58	76.79	61.43	126.46	71.67
2.25	93.75	80.36	64.28	132.34	75.00

STANDARD WEIGHTS PER BUSHEL AND BUSHELS PER TON

	Wt./bu. (lb.)	bu./ton
Barley	48	41.67
Corn, shelled	56	35.71
Corn and cob	70	28.57
Oats	34	58.82
Wheat	60	33.33



FEEDING CORN TO POULTRY

Corn is the basic ingredient in many poultry feeds. The amount of corn in poultry mash depends upon the changing supply and costs of other grains such as wheat, oats, and barley.

About 50 percent of all feed sold commercially is for the poultry industry, and feed represents the largest part of the cost of producing poultry meat and eggs. During the past two decades, efficiency in poultry nutrition has increased tremendously. For example, in 1940 it took 13 weeks to produce a 3½ pound broiler; today, the job is done in 8 to 9 weeks with half the feed.

Commercially prepared feeds containing corn and other grains are increasingly popular among poultrymen because of their nutritional value and ease of handling. An all-mash ration containing corn is available for chicks, growing pullets, and laying hens, and whether the birds are in pens or in cages. An all-mash ration is a complete feed; no additional grain should be fed along with it. This type of ration assures a completely balanced intake of all required nutrients for different age groups. It produces a uniform product (meat or eggs) at the lowest feed cost, and it is simple and convenient for poultrymen to use. Furthermore, it is well adapted to bulk delivery, bulk storage, and use in mechanical feeders.

The physical form of rations is important as well as their nutritive value. Crumbled or pelleted rations are ideal for starting chicks, broilers, and turkeys. They are easier to handle than loose feed, they increase feed consumption and they are less subject to wastage and dustiness. However, pelleted feed is not recommended for pullets on restrictive feeding nor for laying hens. Also birds on pelleted feeds are more prone to cannibalism, which can be controlled by the use of "specs," debeaking, or reducing light intensity in poultry houses.

BROILERS

Corn is a basic ingredient for broiler production. Broiler feeds have become so specialized that it is now possible to obtain a pound of gain with 2.5 pounds of feed or less.

Broiler chicks should be fed a high-energy ration containing 22 to 26 percent protein until they are six or seven weeks of age. They should then receive a high-energy finishing ration containing about 18 to 20 percent protein until ready for market. Suitable



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proteins for broiler production can be found in soybean or rapeseed meal, fishmeal, meat and milk by-products, or alfalfa meal. The energy portion of the ration is available from corn or wheat. The necessary minerals and vitamins are, of course, added, as well as a coccidiostat and an antibiotic.

An excellent guide to the composition of poultry rations is POULTRY FEED FORMULAS, issued yearly by the Department of Poultry Science, Ontario Agricultural College, Guelph, Ontario.

A cage feeder is an efficient way to give laying birds poultry mash containing corn



Copies of this publication may be obtained from:

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